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Title of TC  
Electrical equipment and systems for railways

## **A Background**

TC9 was established on the 24th April 1924 with the former title "Electric traction equipment"

Now it has the task to prepare international standards for the railway field which includes rolling stock, fixed installations, management systems (including communication, signalling and processing systems) for railway operation, their interfaces and their ecological environment.

These standards cover railway networks, metropolitan transport networks (including metros, tramways, trolleybuses and fully automated transport systems) and magnetic levitated transport systems

These standards relate to systems, components and software and they will deal with electrical, electronic and mechanical aspects, the latter being limited to items depending on electrical factors.

These standards deal with electromechanical and electronic aspects of power components as well as with electronic hardware and software components.

These tasks are undertaken in close liaison with CENELEC/TC9X taking into account the needs expressed by users (as UIC and UITP).

A major feature of the railway field is its specificity: even if some work items are similar to those covered in other industrial fields the relevant answers have to take into account the strain of coherence of the railway system as well as the interface specification need.

TC9 includes now 28 P-members : Austria, Belgium, Canada, China, Czech Republic, Denmark, Egypt, Finland, France, Germany, Hungary, Italy, Japan, Korea (D.P.R. of), Korea ( Rep. of), Netherlands, Norway, Poland, Portugal, Romania, Russian Federation, Serbia, Singapore, Spain, Sweden, Switzerland, United Kingdom, USA and 10 observers: Belarus, Bulgaria, Croatia, Greece, India, Indonesia, New Zealand, Slovakia, Slovenia and Ukraine.

## **B Business Environment**

### **B.1 General**

In the recent years, the railway sector has been subject to changes which have greatly influenced the design of railway systems and these changes concern operating characteristics as well as the technology involved.

One consequence of the recent evolutions made is that after a period when the users were the leaders of the standardisation works, the manufacturers are now the more deeply involved and they act on a world wide area.

The task of IEC/TC9 is influenced by regional activities such as those resulting from the adoption of EC Directives by the European Union. Therefore IEC should see where there is a need of an attractive action for worldwide standardization by:

- adapting regional standards when possible;
- creating original International Standards when there is a specific need different from regional ones;
- focusing its means preferably on general worldwide items.

The goal is that in a near future IEC/TC9 will be responsible of a full coherent set of standards, the one based on regional standards included.

## **B.2 Market demand**

International standardisation in the railway field has for a long time been focused to guidance and general considerations.

In any case the demand is driven by the technical development of modern transportation and the movement towards computer based management, control and communication systems while the need to maintain a high level of safety remains a high level priority. These can be a source of difficulty insofar as implementation of solutions is quick, their different characteristics not necessarily compatible and a product standard cannot be restricted to any single accurate product.

It is important that standards do not inhibit development and/or application of new technology for the benefit of the railway industry as a whole (i.e. users, operators, designers, etc.). Therefore, as a minimum, standards should allow use of newer technology without being infringed so that the way to follow for drafting standards appears to be a performance/interface design and not a technology descriptive one.

## **B.3 Trends in technology**

The traditional approach (i.e. product by product) should be supplemented by an approach making better allowance for the functional aspects of systems and subsystems. This approach is justified by the increasing complexity of interaction between equipment and by the application of quality control procedures (ISO 9001) during the design and testing phases.

Increasing performance in traction systems has become possible through techniques based on power electronics on board allowing the use of traction motors having higher power-to-weight ratio.

In the meantime high speed processors were developed for:

- power control (electronics converters or inverters),
- operating control (new operating procedures, automation of some functions, monitoring, diagnostic and maintenance procedures, data transmission for operation and overhaul).

Both power control and operating control have relevant functionalities that are implemented with equipment where software is playing a more and more important role.

Traction systems involve three "paths":

- intelligence path,
- electric power path,
- mechanical power path,

the whole including all apparatus, components and connections of those paths inside/between vehicles, taking the following into account:

- presence of high frequencies, even inside power equipment, requires EMC specifications inside and outside;

- speed increasing causes stray frequencies for mechanical quantities and consequently mechanoacoustic compatibility problems, either inside or outside of vehicles;
- operation on the same network of various traction systems (i.e. dc and ac supply) demands further attention to galvanic compatibility concerns between them and with environment;
- interchangeability of locomotives and rolling stocks requires to maintain compatibility for modern control systems;
- automatic people movers require specific provisions as fully automatic systems...

#### **B.4 Market trends**

The expansion of urban and suburban transport systems as well as automatic people movers together with the increasing speed of inter-city trains should be emphasised.

This evolution has nevertheless not deeply changed some specific conditions applying to the use of electrical equipment on railways, namely electric propulsion by motors, particular environmental conditions on board vehicles, an exceptional life cycle (up to 40 years) and high reliability.

The increase of trade exchange and the development of new technology lead to an ever growing need of technical compatibility between systems and sub-systems.

#### **B.5 Ecological environment**

In terms of environment, the considerations (e.g.: noise emission of equipment) to be incorporated into railway product standards can be performance requirements only provided that such products standard are developed as performance and interface specifications and not as technologically descriptive.

In that respect amendments to existing product standards should be envisaged to take into consideration also the disposal, recyclability, reusability and toxicity concerns where necessary.

In addition specific environmental railway generic standard should be developed for application and reference in various product standards:

- EMC specifications are developed to cover the emission of the railway system towards the external world;
- Other environmental aspects such as stray currents are investigated;
- Acoustics should be envisaged as a possible matter of standardisation as well.

In accordance with the creation of TC 111, for environmental matters that will be dealt with by TC9, the support and advice of TC111 will be sought.

TC9 should explore further possibilities for standardization projects to assist the reduction of energy consumption in trains and associated infrastructure.

#### **C System approach aspects**

The whole railway field is technically a very important system because it involves a lot of various technologies having to work efficiently together inside equipment or railway subsystems in order that they are able to operate properly and in a safe way. This aspect explains two main characteristics of TC9 activity:

- TC9 is developing standards which can be of various kinds: system, component or principles;
- There is no particular TC in IEC with which a standardization system approach can be permanently identified but a lot of liaisons which are set up regarding the current concerns at one moment.

In order to meet that fundamental goal, International railway standardization shall consider in a coherent way the application of standards which could be fully specific, partly specific or not specific to the railway field.

On the other hand TC9 is fully integrated into the whole International IEC process which involves a lot of TCs of various kinds: horizontal, technology specialized, concept or safety or environment oriented.

It is the reason why TC9 has been adopting the following policy for a long time:

- Once the need for a standard is identified, it is first investigated whether existing standards prepared by other TCs can apply, fully or partly,
- If they exist and they can fully meet the goal, nothing more is to be done by TC9,
- If they exist but there is a need for specific changes or additions for the railways, drafting a railway standard can be undertaken within TC9 provided that this standard will refer to the existing more general ones and will specify only what the latter do not contain; In the case that a railway standard includes specific requirements which are derived from a general standard, and that this general standard is revised then the railway standard shall be revised if necessary
- If they do not exist, TC9 of course undertakes the full task, with possible liaisons as appropriate.

## **D Objectives and strategies**

### **D.1 General**

To improve the efficiency of standards development, TC 9 standards aim at global common performance in principle according to the ISO/IEC Directives, Part 2, 4.2.

The following topics have been currently identified and they are limited to electrical equipment and systems relevant to TC9 scope.

#### Environmental aspects

- EMF
- Acoustics
- Stray currents

#### Safety aspects

- Electrical safety
- Protection against fire
- Safety hazards in long tunnels
- Passenger safety (including passenger alarm systems, and communication between the operator and passengers)
- Event recorder (e.g. "Black box" or automatic system surveillance )

*NOTE: all the safety aspects covered above are to be developed respecting safety regulations that may exist elsewhere.*

#### Functional aspects

- Demonstrating of functioning of one or several systems or subsystems
- Methods for demonstrating features of systems or subsystems
- Methods and acceptance criteria for testing of subsystems or systems.

#### Reliability aspects

- Methods for assessing
- Testing.

All these topics are considered in the framework of the growing importance of urban transport and of the need to avoid to re-invent costly new solutions for each new metro system all over the world.

## D.2 Strategy management

In order to anticipate the needs and therefore to investigate the operating strategy to be proposed for adoption by TC9 plenary, a *Chairman Advisory Group (CAG)* has been set up. It is in charge of dealing with the following:

- to identify priorities in the technical activities;
- to identify technologies to be standardised;
- to identify subjects needed but not yet covered by current standardisation;
- to identify and evaluate any existing PAS and/or de-facto standards and/or standardisation trend;
- to provide guidance to TC9 in defining its Strategic Business Plan, particularly in light of the above;
- to review market needs of the particular sector taking into account the needs of users including consumers where appropriate;
- to review and establish priorities of work at the systems level in order to help TC9 in this development;
- to assess effectiveness of the programme of work in meeting the needs of the sector;
- to advise TC9 on possible overlaps, conflicts and gaps and recommend corrective action;
- to review all new work items;
- to act in the framework of IEC policy on Global Relevance and as an advisory group only;
- to identify the items impacted by:
  - European Interoperability Directives,
  - European TSIs,
  - regulations in Asia,
  - regulations in America,
  - any other ...
- to provide guidance to convenors and project leaders for the drafting of their documents.

This *Chairman Advisory Group* is chaired by IEC/TC9 chairman, the secretariat being that of TC9. The Officers of CENELEC/TC9X are invited as guests. The members are high rank representative of operators and supply industry within every region of the world. This group works along the terms of reference which have been adopted by TC9.

## D.3 Merging Strategy with CENELEC

In order to implement the Dresden Agreement in a strategic way, IEC and CENELEC have agreed upon a Merging Strategy between IEC TC9 and CENELEC TC 9X

This merging strategy is organised as a general principle document, referred to as 9/1060/INF, and an implementation document, currently referred to as 9/1141/INF. These documents will be updated from time to time by the Officers of IEC/TC9 and Cenelec/TC9X.

## E Action plan

The current work programme of TC9 is recorded in the IEC database.

In order to take into account the limited expertise resources, urgent European priority items such as provisions linked with interoperability Directives are dealt with at European level only for the time being and will be discussed at international level (preferably at CD or CDV stage when approved as new item) when completed by CENELEC whilst following the Dresden agreement as far as possible.

A close permanent relationship has to be maintained and improved between the entities at present involved in international and regional railway standardisation work, namely IEC/TC9, CENELEC/TC9X, UIC and UITP.

It will be necessary to harmonise as far as possible the horizontal standards of general interest and the railway standards prepared by TC9; as stated above, relevant formal liaisons should be set up where necessary, e.g. with CISPR for EMC-related standards.

TC9 has to hold meetings according to an appropriate frequency (i.e. once a year for the time being).

In order to ensure an efficient work management, common meetings of convenors and project leaders have to be held regularly between plenary meetings (i.e. once a year for the time being, roughly six months after a plenary meeting) ; during such meetings TC9/Officers, convenors and project leaders are empowered to agree upon recommendations to be submitted to TC9 for endorsement.

TC9 encourages the use of multimedia means in order to lower the costs and improve efficiency

In order to ensure a coherent monitoring of railway standardisation and to implement the merging strategy with CENELEC, common meetings of chairmen and secretaries of IEC/TC9 and CENELEC/TC9X have to be held regularly (i.e. once a year for the time being).

#### **F Useful links to IEC web site**

[IEC TC 9 dashboard](#) (enter 9) - includes the TC/SC Officers, Scope, Liaison committees, WG/MT//PT structure, Membership (IEC Member Countries), Publications issued and Work and Maintenance Programmes.

Name or signature of the secretary  
Ch. ESPITALIER and Th. LAINE